6.4 Monitoring pipettes and volume verification.

6.4.1 Quarterly, each adjustable pipette is verified by a QA/QC designee to ensure that it is in good working condition and that the volumes delivered across the range of the pipettes are within 5% of the target volume delivered. All pipettes used for industrial hygiene samples under the AIHA-LAP accreditation will be sent annually to an ISO/IEC 17025:2005 accredited calibration laboratory and new pipettes will be purchase with the calibration certificate. Any pipettes used for samples from a DOE site must meet the 2% criteria which will be checked daily before these samples are prepped (please see DOD and DOE Consolidated Quality Systems Manual, Version 5, July 2013, Module 2 table on page 27).

6.4.1.1 Allow a beaker of deionized water to equilibrate to room temperature and then record the temperature to the nearest degree Celsius in the QA/QC spreadsheet located in the "Finished network drive".

6.4.1.2 Determine the density of water at room temperature using the table in Appendix 10.3 and record the density in the spreadsheet.

6.4.1.3 Place a disposable beaker on the 4-place analytical balance and tare the balance to read 0.

6.4.1.4 Select a pipette and record the identifier in the QA/QC spreadsheet. Identifiers used include: the manufacturer's serial number or a unique identifier assigned by the laboratory.

6.4.1.5 Place a disposable pipette tip on the pipette and adjust to a target delivery volume, if possible, including low, mid-range, or high volume.

6.4.1.6 Pipette the deionized water into the disposable beaker and record the weight of the water.

6.4.1.7 Repeat 2 more times and average the three weights.

6.4.1.8 Correct the weight of the water based on the density correction in step 6.4.1.2 by: (average weight of water/density correction) and record the corrected volume of water delivered.

6.4.1.9 Calculate the recovery of the water by dividing the corrected volume by the target amount then multiplying by 100 to convert to a percentage.

6.4.1.10 Adjust the pipette to a different target volume (low, mid, or high), if possible, and repeat steps 6.4.1.6 through 6.4.1.9.

6.4.1.11 Accuracy and precision are calculated and charted in an excel spreadsheet that is reviewed by QA Department personnel. Pipettes are deemed acceptable when all recoveries tested are within ±5% (2% for DOE samples) of the target volume.

6.4.1.12 If the recovery volume is beyond 5% for any of the target volumes, QA/QC will remove the pipette from service until repairs can be made returning the pipette to a usable condition.

6.4.1.12.1 Repairs include: replacement of o-rings, cleaning and lubrication of the piston and chamber, adjustment of volume indicator.

6.4.1.12.2 If repairs do not provide acceptable performance, pipettes will be returned to the manufacturer for service or replaced.

6.4.2 Dispenser Devices

6.4.2.1 Dispensers are monitored quarterly by the QA Manager or designee. Generally, dispenser devices are not used for purposes that directly affect the quality of analytical tests.

6.4.2.2 Adjust the dispenser to deliver a target volume and dispense liquid into a class A glass graduated cylinder.

6.4.2.3 If the volume of the solution is within ± 5% of the target volume, the dispenser is acceptable for use.

6.4.2.4 If the volume of the solution is beyond 5% of the target volume, adjust the delivery volume and repeat steps 6.3.2.1 through 6.3.2.3 until a satisfactory volume is dispensed.

6.4.2.5 If the volume of the solution cannot be achieved within the ± 5% range, take dispenser out of service and order a replacement.

6.5 Monitoring optical microscopes.

6.5.1 QA/QC is responsible for ensuring that optical microscopes receive at least annual cleaning and maintenance by an external calibration/repair service that performs any service necessary, on-site.

6.5.1.1 The current service used by the laboratory is: B&B Microscopes, P.O. Box 30, Northgate Dr., Warrendale, PA 15086 (Phone: 800-433-1749).

6.5.1.2 An equivalent service provider is acceptable.

6.6 Monitoring thermometers and thermocouples.

6.6.1 Reference thermometers are either verified or purchased annually by an external calibration/repair service that performs calibration.

6.6.1.1 The current service provider is ICL Calibration Laboratories, Inc., 1501 Decker Avenue, Suite 118, Stuart, FL 34994 (Phone: 800-713-6647).

6.6.1.2 An equivalent service provider may be used as long as they maintain NVLAP and/or ISO/IEC 17025 (current version) certification.

6.6.1.2.1 Information required on calibration certificates for all balances include: appropriate statements of measurement results, measurement uncertainty, and traceability.

6.6.1.3 If shipping thermometers to the calibration service for recalibration, place each thermometer in the appropriate shipping/storage case and place the storage case in a box with sufficient packing material to protect the cases from damage during shipment.

6.6.1.4 If purchasing new thermometers, purchase thermometer shipping cases, if available, to protect the thermometer when shipment of the device is necessary for recalibration.

6.6.2 Daily use glass laboratory thermometers and IR Guns are verified at least semi-annually by QA/QC or designee at the expected range of use.

6.6.2.1 Freezer and refrigerator thermometers are verified at a single temperature near the temperature of normal use.

6.6.2.1.1 All refrigerator thermometers are collected by QA/QC or designee and placed in a single refrigerator or freezer.

6.6.2.1.2 A reference thermometer is placed in the container with the thermometers to be verified. The container and water must be deep enough to meet the thermometer immersion line, if present.

6.6.2.1.3 The water is allowed to equilibrate to a constant temperature (approximately 2-4 hours).

6.6.2.1.4 The readings of all thermometers, including the reference, are recorded as quickly as possible in a QA/QC notebook.

6.6.2.1.5 Reading must be within 1.0°C of the reference reading to be considered usable

6.6.2.2 Thermometers used for heating units are verified at least quarterly at temperatures that bracket the target temperature. For the dial thermometer used in the NEVAP, see section 6.6.4.

6.6.2.2.1 All thermometers used for heating units are collected and placed in a container with sand or water deep enough to meet the thermometer immersion line, if present.

6.6.2.2.2 The appropriate reference thermometer is added to the container with those to be verified and the container is allowed to equilibrate to room temperature (approximately 2-4 hours).

6.6.2.2.3 The readings of all thermometers, including the reference, are recorded in the appropriate QA/QC notebook.

6.6.2.2.4 The container containing the thermometers is then placed on a heating source and allowed to equilibrate to temperature (approximately 2-4 hours).

6.6.2.2.5 All readings of all thermometers, including the reference, are recorded in the appropriate QA/QC notebook.

6.6.2.2.6 Reading must be within 1.0°of the reference reading at both temperatures to be considered usable.

6.6.2.3 Any thermometer that does not agree within 1.0°C will be replaced with a unit that is shown to perform within the specification required.

6.6.3 Thermocouples, or electronic thermometers, and each probe utilized by the thermocouple are verified at least quarterly by a QA/QC designee across the expected range of use.

6.6.3.1 Thermocouples are verified at, at least, two temperatures covering the expected range of use.

6.6.3.2 Verification of low temperature can be performed in conjunction with refrigeration thermometer verification and high-end verification can be performed in conjunction with heating source thermometers.

6.6.3.2.1 Following the equilibration time, place the probe for the thermocouple in the solution and allow the thermocouple to reach a constant reading. This time will vary depending on the thermocouple used.

6.6.3.2.2 Record the reading of the reference thermometer and the thermocouple in the appropriate QA/QC notebook.

6.6.3.2.3 Readings must be within 1.0°C of the reference reading at both temperatures to be considered usable.

6.6.3.3 Any thermocouple and probe that does not agree within 1.0°C will be returned to the manufacturer for re-calibration and/or repair or replaced with a unit that is shown to perform within the specification required.

6.6.3.3.1 Thermocouples that require repair will be packaged to ensure that they are not damaged in transport to the repair service by QA/QC.

6.6.4 The dial thermometer on the NEVAP unit, along with any other dial thermometers that may be purchased and used in the future, must be verified at least annually by a QA/QC designee.

6.6.4.1 The dial thermometer is verified at the approximate temperature of use.

6.6.4.1.1 Place the dial thermometer in a water-filled Hotblock digestion vessel along with a reference thermometer and place the vessel on the Hotblock digestor.

6.6.4.1.2 Allow the water in the vessel to equilibrate (approximately 2-4 hours) and compare the reading on the reference thermometer to the dial thermometer.

6.6.4.1.3 Document both readings in the appropriate notebook.

6.6.4.1.4 Readings must be within 1.0°C of the reference reading for the dial thermometer to be considered usable.

6.6.4.1.5 If the dial thermometer does not agree within 1.0°C it should be replaced with a unit that is shown to perform within the specification required.

6.7 Monitoring hotblock/oven temperature setting.

6.7.1 A QA/QC designee is responsible for ensuring that each Hotblock unit is set to the proper digestion temperature per digestion determinative methods.

6.7.1.1 Monitoring by a QA/QC designee will occur at least semi-annually.

6.7.1.1.1 Place a verified thermometer into a digestion vessel containing a sufficient amount of sand so that the thermometer bulb is submerged.

6.7.1.1.2 Place the digestion vessel into a well of the Hotblock apparatus and allow the temperature of the sand in the vessel to equilibrate (1/2-1 hour).

6.7.1.1.3 Remove the vessel and read the thermometer to the nearest degree.

6.7.1.1.4 Record the reading in the appropriate notebook.

6.7.1.1.5 If the reading is not within method required digestion temperature range, adjust the temperature setting as directed by the manufacturer and repeat steps above until the Hotblock temperature falls reliably within the desired temperature range.

6.8 Monitoring reagent water polisher performance.

6.8.1 The reagent water polisher is a Barnstead 4 cartridge water purifying system that produces water with a conductivity of ≥18 megaohms. The conductivity range is 0.056 $\mu S/cm^{-1}$ (Type I) to 1.0 $\mu S/cm^{-1}$ (Type II) (ASTM D1193-99).

6.8.2 The water polisher is utilized for standards preparation, glassware rinsing, blank matrix analyses, dilutions and various other uses within the laboratory when contaminants in water must be avoided.

6.8.3 The conductivity of the water produced by the polisher is monitored on a weekly basis by QA/QC.

6.8.3.1 A traceable low range probe (Wheatstone-Bridge type or equivalent) along with an appropriate conductivity meter is required.

6.8.3.2 Follow the conductivity meter's directions to set the nominal cell constant to 0.1 cm^{-1}.

6.8.3.3 In the calibration mode, the meter will request that the user input the correct certified value of the standard.

6.8.3.3.1 The current standard used by the laboratory is a trace level single shot traceable standard (~4.79 µS/cm) but any trace level standard may be used.

6.8.3.3.2 Standards commonly used for sample conductivity testing are not suitable for calibration and monitoring of reagent water due to the higher level of variability that occurs at the extreme low concentration level.

6.8.3.4 The standard concentration value is input by QA/QC and the meter is then set for analysis.

6.8.3.5 QA/QC obtains a sample of the water from the polisher (allowing the polisher to discharge approximately 2 liters prior to sampling), the probe is rinsed with 3 portions of water from the polisher and then placed the sample beaker.

6.8.3.6 The conductivity probe is allowed to equilibrate to a stable setting.

6.8.3.7 Following equilibration, the reading from the meter is recorded.

6.8.3.8 The temperature is recorded and the cell k constant from the calibration of the meter is also recorded in the QA/QC notebook.

6.8.3.9 From the recordings, the conductivity of the polisher water at 25°C can be determined using the formula in the calculations section of this SOP.

6.9 Microsyringe Verification

6.9.1 Microsyringes used for **all** environmental work must be ordered with certificates of accuracy/conformance by the QA Manager or designee. These certificates are kept in the QA office files. For tracking purposes, each syringe is given an identification number before being assigned to the analyst. When a syringe is no longer viable, the QA Manager will be notified and the syringe will be removed from the active list and a new syringe will be issued.

7.0 QA/QC REQUIREMENTS

7.1 See Sec. **6.0.**

8.0 DEFINITIONS OR CALCULATIONS

8.1 From the recordings, the conductivity of the polisher water at 25°C can be determined using the formula:

$$Conductivity\ @\ 25^{o}C = \frac{C_m * K_c}{1 + 0.0191(t - 25)}$$

where C_m indicates measured conductivity from meter reading (µS/cm),
K_c indicates conductivity constant from calibration,
0.0191mS/m per °C is the temperature coefficient of resistance correction factor for 25 °C, and
T indicates temperature of sample (degrees Celsius)

9.0 DOCUMENTATION REQUIREMENTS

9.1 See Sec. **6.0.**

10.0 APPENDICES

10.1 Refrigerator/Freezer Temperature Log

10.2 Example of Daily Balance Logbook Page

10.3 Relative Density of Water Based on Temperature Chart

Appendix 10.1: ALS LABORATORIES REFRIGERATOR/FREEZER TEMPERATURE LOG

MONTH/YEAR_____
REFRIGERATOR/FREEZER PN_____
THERMOMETER ID_____

REFRIGERATOR CONTROL LIMITS: 2 to 6 °C
FREEZER CONTROL LIMITS: -10 to -20 °C
All measurements in °C

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Refer to SOP QA-011, "Supporting Equipment Calibrations and Verifications"

Appendix 10.2: Example of Daily Balance Logbook Page

Balance Calibration Logbook
Property #:
Model Number:

Check weights must encompass working range of balance.

Acceptance Limits	0.00996-0.01004	0.99996-1.00004 Hanging: 0.9996-1.0004	4.99996-5.00004

Date (MM/DD/YY)	Initials	Auto Calibration (Yes/No)	0.010 g	1.0 g	5.0 g	Notes/Corrective Action

Appendix 10.3: Relative Density of Water Based on Temperature Chart

Relative Density of Water Based on Temperature Chart

Temperature (°C)	Density (g/ml)
10	0.99973
11	0.99963
12	0.99952
13	0.99940
14	0.99927
15	0.99913
16	0.99897
17	0.99880
18	**0.99862**
19	**0.99843**
20	**0.99823**
21	**0.99802**
22	**0.99780**
23	**0.99756**
24	0.99732
25	0.99707
26	0.99681
27	0.99654
28	0.99626
29	0.99597

Note: The most common recorded temperature ranges are 17-24 °C.

APPENDIX B
TETRA TECH INTERIOR SOPS

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APPENDIX D

TETRA TECH SOPS

SOP APPROVAL FORM

TETRA TECH EM INC.

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

GENERAL EQUIPMENT DECONTAMINATION

SOP NO. 002

REVISION NO. 3

Last Reviewed: June 2009

R Riesing

Quality Assurance Approved

6-19-09

Date

1.0 BACKGROUND

All nondisposable field equipment must be decontaminated before and after each use at each sampling location to obtain representative samples and to reduce the possibility of cross-contamination.

1.1 PURPOSE

This standard operating procedure (SOP) establishes the requirements and procedures for decontaminating equipment in the field.

1.2 SCOPE

This SOP applies to decontaminating general nondisposable field equipment. To prevent contamination of samples, all sampling equipment must be thoroughly cleaned prior to each use.

1.3 DEFINITIONS

Alconox: Nonphosphate soap, obtained in powder detergent form and dissolved in water

Liquinox: Nonphosphate soap, obtained in liquid form for mixing with water

1.4 REFERENCES

U.S. Environmental Protection Agency (EPA). 1992a. "Guide to Management of Investigation-Derived Wastes." Office of Solid Waste and Emergency Response. Washington D.C. EPA 9345.3-03FS. January.

EPA. 1992b. "RCRA Ground-Water Monitoring: Draft Technical Guidance." Office of Solid Waste. Washington, DC. EPA/530-R-93-001. November.

EPA. 1994. "Sampling Equipment Decontamination." Environmental Response Team SOP #2006 (Rev. #0.0, 08/11/94). http://www.ert.org/mainContent.asp?section=Products&subsection=List

1.5 REQUIREMENTS AND RESOURCES

The equipment required to conduct decontamination is as follows:

- Scrub brushes
- Large wash tubs or buckets
- Squirt bottles
- Alconox or Liquinox
- Tap water
- Distilled water
- Plastic sheeting
- Aluminum foil
- Methanol or hexane
- Isopropanol (pesticide grade)
- Dilute (0.1 N) nitric acid

2.0 PROCEDURE

The procedures below discuss decontamination of personal protective equipment (PPE), drilling and monitoring well installation equipment, borehole soil sampling equipment, water level measurement equipment, general sampling equipment, and groundwater sampling equipment.

2.1 PERSONAL PROTECTIVE EQUIPMENT DECONTAMINATION

Personnel working in the field are required to follow specific procedures for decontamination prior to leaving the work area so that contamination is not spread off site or to clean areas. All used disposable protective clothing, such as Tyvek coveralls, gloves, and booties, will be containerized for later disposal. Decontamination water will be containerized in 55-gallon drums (refer to Section 3.0).

Personnel decontamination procedures will be as follows:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.

2. Maintain the same level of personal protection as was used for sampling.

3. Wash neoprene boots (or neoprene boots with disposable booties) with Liquinox or Alconox solution and rinse with clean water. Remove booties and retain boots for subsequent reuse.

4. Wash outer gloves in Liquinox or Alconox solution and rinse in clean water. Remove outer gloves and place into plastic bag for disposal.

5. Remove Tyvek or coveralls. Containerize Tyvek for disposal and place coveralls in plastic bag for reuse.

6. Remove air purifying respirator (APR), if used, and place the spent filters into a plastic bag for disposal. Filters should be changed daily or sooner depending on use and application. Place respirator into a separate plastic bag after cleaning and disinfecting.

7. Remove disposable gloves and place them in plastic bag for disposal.

8. Thoroughly wash hands and face in clean water and soap.

2.2 DRILLING AND MONITORING WELL INSTALLATION EQUIPMENT DECONTAMINATION

All drilling equipment should be decontaminated at a designated location on site before drilling operations begin, between borings, and at completion of the project. Decontamination may be conducted on a temporary decontamination pad constructed at satellite locations within the site area in support of temporary work areas. The purpose of the decontamination pad is to contain wash waters and potentially contaminated soil generated during decontamination procedures. Decontamination pads may be constructed of concrete, wood, or plastic sheeting, depending on the site-specific needs and plans. Wash waters and contaminated soil generated during decontamination activities should be considered contaminated and thus, should be collected and containerized for proper disposal.

Monitoring well casing, screens, and fittings are assumed to be delivered to the site in a clean condition. However, they should be steam cleaned and placed on polyethylene sheeting on-site prior to placement downhole. The drilling subcontractor will typically furnish the steam cleaner and water.

The drilling auger, bits, drill pipe, any portion of drill rig that is over the borehole, temporary casing, surface casing, and other equipment used in or near the borehole should be decontaminated by the drilling subcontractor as follows:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.
2. Maintain the same level of personal protection as was used for sampling.
3. Remove loose soil using shovels, scrapers, wire brush, etc.
4. Steam clean or pressure wash to remove all visible dirt.
5. If equipment has directly or indirectly contacted contaminated media and is known or suspected of being contaminated with oil, grease, polynuclear aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), or other hard to remove organic materials, rinse equipment with pesticide-grade isopropanol.
6. To the extent possible, allow components to air dry.
7. Wrap or cover equipment in clear plastic until it is time to be used.
8. All wastewater from decontamination procedures should be containerized.

2.3 BOREHOLE SOIL SAMPLING DOWNHOLE EQUIPMENT DECONTAMINATION

All soil sampling downhole equipment should be decontaminated before use and after each sample as follows:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.
2. Maintain the same level of personal protection as was used for sampling.
3. Prior to sampling, scrub the split-barrel sampler and sampling tools in a wash bucket or tub using a stiff, long bristle brush and Liquinox or Alconox solution.
4. After sampling, steam clean the sampling equipment over the rinsate tub and allow to air dry.
5. Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
6. Containerize all water and rinsate; disposable single-use sampling equipment should also be containerized.
7. Decontaminate all equipment placed down the hole as described for drilling equipment.

2.4 WATER LEVEL MEASUREMENT EQUIPMENT DECONTAMINATION

Field personnel should decontaminate the well sounder and interface probe before inserting and after removing them from each well. The following decontamination procedures should be used:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.
2. Maintain the same level of personal protection as was used for sampling.
3. Wipe the tape and probe with a disposable Alconox- or Liquinox-impregnated cloth or paper towel.
4. If immiscible layers are encountered, the interface probe may require steam cleaning or washing with pesticide-grade isopropanol.
5. Rinse with deionized water.

2.5 GENERAL SAMPLING EQUIPMENT DECONTAMINATION

All nondisposable sampling equipment should be decontaminated using the following procedures:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.
2. Maintain the same level of personal protection as was used for sampling.
3. To decontaminate a piece of equipment, use an Alconox wash; a tap water wash; a solvent (isopropanol, methanol, or hexane) rinse, if applicable, or dilute (0.1 N) nitric acid rinse, if applicable; a distilled water rinse; and air drying. Use a solvent (isopropanol, methanol, or hexane) rinse for grossly contaminated equipment (for example, equipment that is not readily cleaned by the Alconox wash). The dilute nitric acid rinse may be used if metals are the analyte of concern.
4. Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
5. Containerize all water and rinsate.

2.6 GROUNDWATER SAMPLING EQUIPMENT

The following procedures are to be employed for the decontamination of equipment used for groundwater sampling. Decontamination is not necessary when using disposable (single-use) pump tubing or bailers. Bailer and downhole pumps and tubing decontamination procedures are described in the following sections.

2.6.1 Bailers

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.
2. Maintain the same level of personal protection as was used for sampling.
3. Evacuate any purge water in the bailer.
4. Scrub using soap and water and/or steam clean the outside of the bailer.
5. Insert the bailer into a clean container of soapy water. Thoroughly rinse the interior of the bailer with the soapy water. If possible, scrub the inside of the bailer with a scrub brush.
6. Remove the bailer from the container of soapy water.
7. Rinse the interior and exterior of the bailer using tap water.
8. If groundwater contains or is suspected to contain oil, grease, PAH, PCB, or other hard to remove organic materials, rinse equipment with pesticide-grade isopropanol.
9. Rinse the bailer interior and exterior with deionized water to rinse off the tap water and solvent residue, as applicable.
10. Drain residual deionized water to the extent possible.
11. Allow components to air dry.
12. Wrap the bailer in aluminum foil or a clean plastic bag for storage.
13. Containerize the decontamination wash waters for proper disposal.

2.6.2 Downhole Pumps and Tubing

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.

2. Maintain the same level of personal protection as was used for sampling.

3. Evacuate any purge water in the pump and tubing.

4. Scrub using soap and water and/or steam clean the outside of the pump and, if applicable, the pump tubing.

5. Insert the pump and tubing into a clean container of soapy water. Pump/run a sufficient amount of soapy water to flush out any residual well water. After the pump and tubing are flushed, circulate soapy water through the pump and tubing to ensure that the internal components are thoroughly flushed.

6. Remove the pump and tubing from the container.

7. Rinse external pump components using tap water.

8. Insert the pump and tubing into a clean container of tap water. Pump/run a sufficient amount of tap water through the pump to evacuate all of the soapy water (until clear).

9. If groundwater contains or is suspected to contain oil, grease, PAH, PCB, or other hard to remove organic materials, rinse the pump and tubing with pesticide-grade isopropanol.

10. Rinse the pump and tubing with deionized water to flush out the tap water and solvent residue, as applicable.

11. Drain residual deionized water to the extent possible.

12. Allow components to air dry.

13. For submersible bladder pumps, disassemble the pump and wash the internal components with soap and water, rinse with tap water, isopropanol (if necessary), and deionized water, and allow to air dry.

14. Wrap pump and tubing in aluminum foil or a clean plastic bag for storage.

15. Containerize the decontamination wash waters for proper disposal.

3.0 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) can include disposable single-use PPE and sampling equipment, soil cuttings, and decontamination wash waters and sediments. Requirements for waste storage may differ from one facility to the next. Facility-specific directions for waste storage will be provided in project-specific documents, or separate direction will be provided by the project manager. The following guidelines are provided for general use:

1. Assume that all IDW generated from decontamination activities contains the hazardous chemicals associated with the site unless there are analytical or other data to the contrary. Waste solution volumes could vary from a few gallons to several hundred gallons in cases where large equipment required cleaning.

2. Containerized waste rinse solutions are best stored in 55-gallon drums (or equivalent containers) that can be sealed until ultimate disposal at an approved facility.

3. Label IDW storage containers with the facility name and address, date, contents, company generating the waste, and an emergency contact name and phone number.

4. Temporarily store the IDW in a protected area that provides access to the containers and allows for spill/leak monitoring, sampling of containers, and removal following determination of the disposal method.

SOP APPROVAL FORM

TETRA TECH, INC.

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

PACKAGING AND SHIPPING SAMPLES

SOP NO. 019

REVISION NO. 7

Last Reviewed: November 2014

Carla J Bank

Quality Assurance Approved

November 24, 2014

Date

1.0 BACKGROUND

In any sampling program, the integrity of a sample must be ensured from its point of collection to its final disposition. This standard operating procedure (SOP) describes procedures for packaging and shipping samples. Steps in the procedures should be followed to ensure sample integrity and to protect the welfare of persons involved in shipping and receiving samples.

1.1 PURPOSE

This SOP establishes the requirements and procedures for packaging and shipping samples. It has been prepared in accordance with the U.S. Environmental Protection Agency (EPA) "Contract Laboratory Program Guidance for Field Samplers." Procedures described in this SOP should be followed for all routine sample packaging and shipping. If procedures are to be modified for particular contract- or laboratory-specific requirements, modified procedures should be clearly described in site-specific plans such as work plans, field sampling plans (FSPs), or quality assurance project plans (QAPPs). Deviations from the procedures in this SOP must be documented in a field logbook. This SOP assumes that samples are already in the appropriate sample jars and that the sample jars are labeled.

This SOP does not cover the packaging and shipment of Dangerous Goods or Hazardous Materials. The shipment of Dangerous Goods (by air) and Hazardous Materials (by ground) requires specialized training. If you have NOT received this training in the last two years, you are NOT qualified to package or ship these materials and may be personally liable for any damages or fines. Contact one of Tetra Tech's shipping experts for assistance. Instructions to access the training course, shipping experts and health and safety (H&S) contacts, and general information on packaging and shipping hazardous substances and dangerous goods can be obtained by checking the links provided in Section 1.4 (References).

1.2 SCOPE

This SOP applies to packaging and shipping of environmental and nonhazardous samples. This SOP does not address shipping dangerous goods or hazardous materials.

1.3 DEFINITIONS

Airbill: An airbill is a shipping form (such as a FedEx shipping form) acquired from the commercial shipper and is used to document shipment of the samples from the sampler to the designated analytical laboratory (see Figure 1).

Custody-of-Custody form: A chain-of-custody form is used to document the transfer of custody of samples from the field to the designated analytical laboratory (see Figure 2). The chain-of-custody form is critical to the chain-of-custody process and is used to identify the samples in each shipping container to be shipped or delivered to the laboratory for chemical or physical (geotechnical) analysis (see Figure 3).

Custody seal: A custody seal is a tape-like seal and is used to indicate that samples are intact and have not been disturbed during shipping or transport after the samples have been released from the sampler to the shipper (see Figure 4). The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been packaged for shipping (see Figure 5).

Environmental samples: Environmental samples include drinking water, most groundwater and surface water, soil, sediment, treated municipal and industrial wastewater effluent, indoor and ambient air, nonhazardous bulk materials, soil gas, dust, asbestos, and biological specimens. Environmental samples typically contain low concentrations of contaminants and, when handled, require only limited precautionary procedures.

Field Blank: A field blank is any blank sample that is packaged and shipped from the field. Each field blank is assigned its own unique sample number. Field blanks include trip blanks, rinse blanks, and equipment blanks, all intended to assess potential cross-contamination. For example, a trip blank checks for contamination during sample handling, storage, and shipment from the field to the laboratory.

Nonhazardous samples: Nonhazardous samples are those samples that do not meet the definition of a hazardous sample and **do not** need to be packaged and shipped in accordance with the International Air Travel Association's (IATA's) "Dangerous Goods Regulations" (DGR) or U.S. Department of Transportation's (U.S. DOT's) "Hazardous Materials Regulations" (HMR) defined in Title 49 Code of Federal Regulations (CFR).

The following definitions are provided to further distinguish environmental and nonhazardous samples from dangerous good and hazardous samples:

Dangerous goods: Dangerous goods are articles or substances that can pose a significant risk to health, safety, or property when transported by air; they are classified as defined in Section 3 of the DGR (IATA 2014).

Hazardous samples: Hazardous samples include dangerous goods and hazardous substances. Hazardous samples shipped by air should be packaged and labeled in accordance with procedures specified by the DGR; ground shipments should be packaged and labeled in accordance with the HMR.

Hazardous substance: A hazardous substance is any material, including its mixtures and solutions, that is listed in 49 CFR 172.101 and its quantity, in one package, equals or exceeds the reportable quantity (RQ) listed in Table 1 to Appendix A of 49 CFR 172.101.

1.4 REFERENCES

General Awareness, H&S contacts, and course training information" click here. (Tetra Tech, Inc., EMI Operating Unit. Intranet) Available on-line at: https://int.tetratech.com/sites/EMI/hs/Pages/Dangerous-Goods-Shipping.aspx

International Air Transport Association (IATA). 2014. "Dangerous Goods Regulations. 2014." For sale at: http://www.iata.org/publications/Pages/standards-manuals.aspx. Updated annually, with new edition available late in year.

U.S. Environmental Protection Agency (EPA). 40 CFR, 763 Subpart F, Asbestos Hazards Emergency Response Act (AHERA).

EPA. 2011. "Contract Laboratory Program Guidance for Field Samplers." EPA 540-R-09-03. Available on-line at: http://www.epa.gov/oerrpage/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf. January.

1.5 REQUIREMENTS AND RESOURCES

The procedures for packaging and shipping samples require the following:

- Coolers (insulated ice chest) or other shipping containers appropriate to sample type
- Ice
- Bubble wrap or similar cushioning material
- Chain-of-custody forms and seals
- Airbills
- Resealable plastic bags for sample jars and ice
- Tape (strapping and clear)
- Large plastic garbage bags for lining the cooler
- Temperature blank sample bottle filled with distilled water can be included in the cooler if appropriate to sample type

- Trip blank samples used to check for volatile contamination during sample handling in the field and shipment from field to laboratory should be included in the cooler if volatile organic compounds are requested for analysis. Also see Field Blank under definitions.

2.0 PROCEDURES

The following procedures apply to packaging and shipping nonhazardous and environmental samples.

2.1 PACKAGING SAMPLES

After they have been appropriately containerized and labeled, environmental samples should be packaged as described in this section. This section covers procedures for packing samples for delivery by commercial carrier (air or ground) and hand delivery of environmental samples (by employee or courier), as well as shipping asbestos and air quality samples. Note that these instructions are general; samplers also should be aware of client-specific requirements concerning the placement of custody seals or other packaging provisions.

2.1.1 Packaging Samples for Delivery by Commercial Carrier (Air or Ground)

Samples shipped by commercial carriers should be packed for shipment using the following procedures and in compliance with all carrier requirements:

Preparing the sample:

1. Allow a small amount of headspace in all bottles, or as instructed by the laboratory (except volatile organic compound [VOC] containers with a septum seal) to compensate for any changes in pressure and temperature during transfer.
2. Be sure the lids on all bottles are tight (will not leak). Lids maybe taped or sealed with custody seals as added protection or as required.
3. Place sample containers in resealable plastic bags.

Preparing the cooler:

1. Secure and tape the drain plug of the cooler with fiber or duct tape.
2. It is recommended that the cooler be lined with a large plastic garbage bag before samples, ice, and absorbent packing material are placed in the cooler.
3. Wrap the sample containers in bubble wrap or line the cooler (bottom and sides) with a cushioning material to prevent breakage of bottles or jars during shipment.
4. Add a sufficient quantity of ice to the cooler to cool samples to 4 °C ($\pm$ 2 °C). Ice should be double bagged in resealable plastic bags to prevent the melted ice from leaking out. If required, include one temperature blank (a sample bottle filled with distilled water) per cooler.

5. For volatile organic analysis (VOA) samples only, include one trip blank for VOA analysis per shipment matrix in each cooler.
6. Fill all remaining space between the bottles or jars with bubble wrap.
7. Securely fasten the top of the large garbage bag with tape (preferably plastic electrical tape).
8. If more than one cooler is being shipped, mark each cooler as "1 of 2," "2 of 2," and so forth.
9. Place the chain-of-custody forms (see Figure 2) into a resealable plastic bag, and tape the bag to the inner side of the cooler lid (see Figure 3). If you are shipping more than one cooler, copy the chain-of-custody form so that there is one copy of all forms in each cooler. The samples listed on the chain-of-custody form must match exactly with the contents of the cooler. Tape any instructions for returning the cooler to the inside of the lid.
10. Close the lid of the cooler and tape it shut by wrapping strapping tape around both ends and hinges of the cooler at least once.
11. Place two signed custody seals (see Figure 4) on opposite sides of the cooler, ensuring that each one covers the cooler lid and side of the cooler (see Figure 5; note that in contrast to the figure, the seals should be placed on the opposite sides of the cooler and offset from each other, rather than directly across from each other as shown in Figure 5). Place clear plastic tape over the custody seals so that the cooler cannot be opened without breaking the seal.
12. Shipping containers must be marked "THIS END UP." Arrow labels, which indicate the proper upward position of the container, may also be affixed to the container (see Figures 3 and 5). A label containing the name, phone number, and address of the shipper should be placed on the outside of the container (Federal Express [FedEx] label) (see Figure 1).
13. Ship samples overnight using a commercial carrier such as FedEx.

2.1.2 Hand Delivery of Environmental Samples (by Employee or Courier)

Samples hand-delivered to the laboratory should be packed for shipment using the following procedures:

Preparing the sample:

1. Bottles can be filled completely with sample (required for VOC containers with a septum seal).
2. Be sure the lids on all bottles are tight (will not leak).

Preparing the cooler:

1. Secure and tape the drain plug of the cooler with fiber or duct tape.
2. Wrap the sample containers in bubble wrap and/or line the cooler (bottom and sides).
3. Add a sufficient quantity of ice to the cooler to cool samples to 4 °C. Ice should be double bagged in resealable plastic bags to prevent the melted ice from leaking out. If required, include one temperature blank (a sample bottle filled with distilled water) per cooler.
4. For VOA samples only, include one trip blank for VOA analysis per shipment matrix in each cooler.
5. If more than one cooler is being shipped, mark each cooler as "1 of 2," "2 of 2,"and so forth.

6. Place chain-of-custody form (see Figure 2) in a resealable plastic bag and tape to the inside of the cooler lid, close the lid, seal with custody seals, and transfer the cooler to the courier (see Figure 3). Alternatively, when samples will be delivered directly to the laboratory, close the cooler and hand-deliver it with the chain-of-custody form. The samples listed on the chain-of-custody form must match exactly with the contents of the cooler.
7. Include any instructions for returning the cooler to the inside of the lid.
8. Place two signed custody seals (see Figure 4) on opposite sides of the cooler, ensuring that each one covers the cooler lid and side of the cooler (see Figure 5, note that the seals should be placed on the opposite sides of the cooler and offset from each other, rather than directly across from each other as shown in Figure 5). Place clear plastic tape over the custody seals so that the cooler cannot be opened without breaking the seal.
9. Shipping containers must be marked "THIS END UP," and arrow labels, which indicate the proper upward position of the container should be affixed to the container (see Figures 3 and 5).

2.1.3 Shipping Asbestos Samples

Asbestos samples shipped by commercial carriers should be packed for shipment using the following procedures and in compliance with all carrier requirements:

1. Place each asbestos sample in a small resealable plastic bag. Place the bags of asbestos samples in a large resealable plastic bag.
2. Select a rigid shipping container (FedEx box) and pack the cassettes upright in a noncontaminating, nonfibrous medium such as a bubble pack to prevent excessive movement during shipping.
3. Avoid using expanded polystyrene because of its static charge potential. Also avoid using particle-based packaging materials because of possible contamination.
4. Affix custody seals to the top of the cassettes or outer sample bag so that the bags cannot be opened without breaking the seal.
5. Insert the chain-of-custody form in the box. Include a shipping bill and a detailed listing of samples shipped, their descriptions and all identifying numbers or marks, sampling data, shipper's name, and contact information.
6. Ship bulk samples in a separate container from air samples. Bulk samples and air samples delivered to the analytical laboratory in the same container will be rejected.
7. For each sample set, designate which are the ambient samples, which are the abatement area samples, which are the field blanks, and which is the sealed blank if sequential analysis is to be performed.
8. Hand-carry samples to the laboratory in an upright position if possible; otherwise, choose that mode of transportation least likely to jar the samples in transit.
9. Address the package to the laboratory sample coordinator by name when known and alert him or her of the package description, shipment mode, and anticipated arrival as part of the chain-of-custody and sample tracking procedures. This information will also help the laboratory schedule timely analysis for the samples when they are received.

2.1.4 Shipping Air Samples

Packaging and shipping requirements for air samples vary depending on the media used to collect the samples and the analyses required. Sampling media typically include Summa canisters and Tedlar bags for whole air samples, filters for metals and particulate matter, and sorbent tubes for organic contaminants. This section of the SOP provides general guidelines for packaging and shipping air samples collected using these media. The project FSP or QAPP should also be reviewed for any additional project-specific requirements or instructions.

Summa Canister Samples

1. Close the canister valve by tightening the knob clockwise or flipping the toggle switch. Replace the brass cap on the canister inlet.
2. If a flow controller was used to collect the air sample over a specified time interval, the flow controller should be removed before replacing the brass cap.
3. Fill out the sample tag on the canister with the sample number and the date and time of collection. Include the identification number of the flow controller on the sample tag if one was used. Make sure the information on the sample tag matches the chain-of-custody form.
4. Complete the chain-of-custody form. In addition to the information normally included, the form should include the following data: sample start and stop dates and times; initial and final Summa canister vacuum readings; Summa canister identification number; and flow controller identification number.
5. Package the Summa canister (and flow controller) in its original shipping box with the original packaging material. Tape the box shut and apply custody seals if required. Note: Summa canisters should never be packaged with ice.
6. Summa canister shipments typically include several canisters, and may include more than one shipping box. The chain-of-custody form for the shipment should be sealed within one of the shipping boxes.
7. Ship the samples by a method that will meet the holding time. Summa canister samples should be analyzed within 30 days of sample collection.

Tedlar Bag Samples

1. Close the Tedlar bag by tightening the valve clockwise.
2. Fill out the label on the bag with the sample number and the date and time of sample collection. Make sure the information on the label matches the chain-of-custody form.
3. Complete the chain-of-custody form.
4. Package the Tedlar bag in a shipping box with appropriate packing material. Multiple bags can be packaged in the same box. Tape the box shut and apply custody seals if required. Note: Tedlar bag samples should not be cooled or packaged with ice.
5. Tedlar bag shipments may include more than one shipping box. The chain-of-custody form for the shipment should be sealed within one of the shipping boxes.

6. Ship the samples using priority overnight delivery. Tedlar bag samples should be analyzed within 3 days of sample collection.

Filter Cassette Samples

1. Disconnect the filter cassette from the air sampling pump and replace the plastic caps on the inlet and outlet openings.
2. Attach a label to the sample that includes the sample number and the date and time of sample collection. Make sure the information on the label matches the chain-of-custody form.
3. Complete the chain-of-custody form. In addition to the information normally included, the form should include the following data: sample start and stop dates and times; initial and final air flow rates (or average flow rate); volume of air sampled; and sampling pump identification number.
4. Package the filter cassettes in a shipping box (such as a FedEx box). Use an appropriate packing material (such as bubble wrap) to separate the samples and prevent damage.
5. Place the chain-of-custody form within the box, seal the box, and apply custody seals if required. Filter cassette samples typically do not need to be cooled, but check the FSP or QAPP for project-specific requirements.
6. Ship the samples by a method that will meet the holding time.

Sorbent Tube Samples

1. Disconnect the sample tube from the air sampling pump and seal both ends of the tube with plastic caps.
2. Complete a sample label that includes the sample number and the date and time of sample collection. Make sure the information on the label matches the chain-of-custody form.
3. If the tube is small and the label cannot be attached to the tube, the tube can be placed in a small sealable plastic bag and the label can be attached to the bag or placed inside the bag with the tube.
4. Complete the chain-of-custody form. In addition to the information normally included, the form should include the following data: sample start and stop dates and times; initial and final air flow rates (or average flow rate); volume of air sampled; and sampling pump identification number.
5. Packaging requirements for the sample tubes will depend on the analysis required, and the sampler should check the FSP or QAPP for project-specific requirements (for example, tubes may need to be wrapped in aluminum foil to prevent exposure to light). Packaging containers and methods include (1) shipping boxes (as described under filter cassette samples), (2) small sample coolers filled with double-bagged ice, and (3) small sample coolers filled with blue ice.
6. Place the chain-of-custody form within the box or container, seal the box or container, and apply a custody seal if required.
7. If coolers are used for shipping, tape instructions for returning the cooler to the inside of the lid.
8. Ship the samples by a method that will meet the holding time.

Polyurethane Foam (PUF) Tube Samples

1. Disconnect the PUF tube from the air sampling pump and wrap the tube in aluminum foil.
2. Attach a label to the wrapped sample tube that includes the sample number and the date and time of sample collection. Make sure the information on the label matches the chain-of-custody form.
3. Wrap the PUF tube in bubble wrap and place the tube in a glass shipping jar.
4. Complete the chain-of-custody form. In addition to the information normally included, the form should include the following data: sample start and stop dates and times; initial and final air flow rates (or average flow rate); volume of air sampled; and sampling pump identification number.
5. Package the PUF tube jars in a cooler that is filled with double-bagged ice. Use bubble wrap or other cushioning material to separate the samples and prevent breakage.
6. Place the chain-of-custody form within the cooler, seal the cooler, and apply a custody seal if required.
7. If coolers are used for shipping, tape instructions for returning the cooler to the inside of the lid.
8. Ship the samples by a method that will meet the holding time. Samples collected in PUF tubes typically must be extracted within 7 days of collection.

2.2 SHIPPING DOCUMENTATION FOR SAMPLES

Airbills, chain-of-custody forms, and custody seals must be completed for each shipment of nonhazardous environmental samples. Figures 1, 2, and 4 provide examples of these forms and instructions for completing them.

Field staff collecting samples should also review their field work plans to confirm what documentation must be completed during each sampling event, including client-specific requirements. For example, some EPA programs have a specific requirement to use Scribe software, an environmental data management system, to create sample documentation, electronically input information into Traffic Report or chain-of-custody forms, and enter other data.

- The Scribe software can be accessed from the EPA Environmental Response Team (ERT) at the following address: http://www.ertsupport.org/scribe_home.htm
- The ERT User Manual for Scribe, reference, and training materials can be accessed from the Scribe Support Web site at the following address: http://www.epaosc.org/scribe

Note that some laboratories must routinely return sample shipping coolers within 14 calendar days after the shipment has been received. Therefore, the sampler should also include instructions for returning the cooler with each shipment, when possible. The sampler (not the laboratory) is responsible for paying for return of the cooler and should include shipping airbills bearing the sampler's shipping account number,

as well as a return address to allow for return of the cooler (see Figure 1). Samplers should use the least expensive option possible for returning coolers.

2.3 SHIPMENT DELIVERY AND NOTIFICATION

A member of the field sampling team must contact the laboratory to confirm it accepts deliveries on any given day, especially Saturdays. In addition, samplers should ensure the laboratory has been notified in advance of the pending shipment and notify any additional parties as required. The sampler needs to know the laboratory's contact name, address, and telephone number and be aware of the laboratory's requirements for receiving samples.

The sampler needs to know the shipping company's name, address, and telephone number (see Figure 1). In addition, samplers should be aware of the sample holding times, shipping company's hours of operation, shipping schedule, and pick-up and drop-off requirements to avoid delays in analytical testing.

Priority Overnight Delivery

Priority overnight delivery is typically the best method for shipment. Delays caused by longer shipment times may cause the sample temperature to rise above the acceptable range of 4° C ($\pm$ 2 ° C) and technical holding may expire, which in turn may compromise sample integrity and require recollection of samples for analysis. If sample delivery procedures are to be modified for particular contract- or laboratory-specific requirements, the procedures should be clearly described in site-specific plans such as work plans, FSPs, or QAPPs.

Saturday Delivery

If planning to ship samples for Saturday delivery, the laboratory must be contacted in advance to confirm it will accept deliveries on Saturdays or arrange for them to be accepted. In addition, samplers should ensure the laboratory has been notified in advance of the pending shipment and notify any additional parties as required.

2.4 HEALTH AND SAFETY CONSIDERATIONS

In addition to the procedures outlined in this SOP, all field staff must be aware of and follow the health and safety practices that result from the Activity Hazard Analyses (AHA) for the project. The AHAs include critical safety procedures, required controls, and minimum personal protective equipment (PPE) necessary to address potential hazards. The hazards specific to project tasks must be identified and

controlled to the extent practicable and communicated to all project personnel via the approved, project-specific Health and Safety Plan (HASP).

3.0 POTENTIAL PROBLEMS

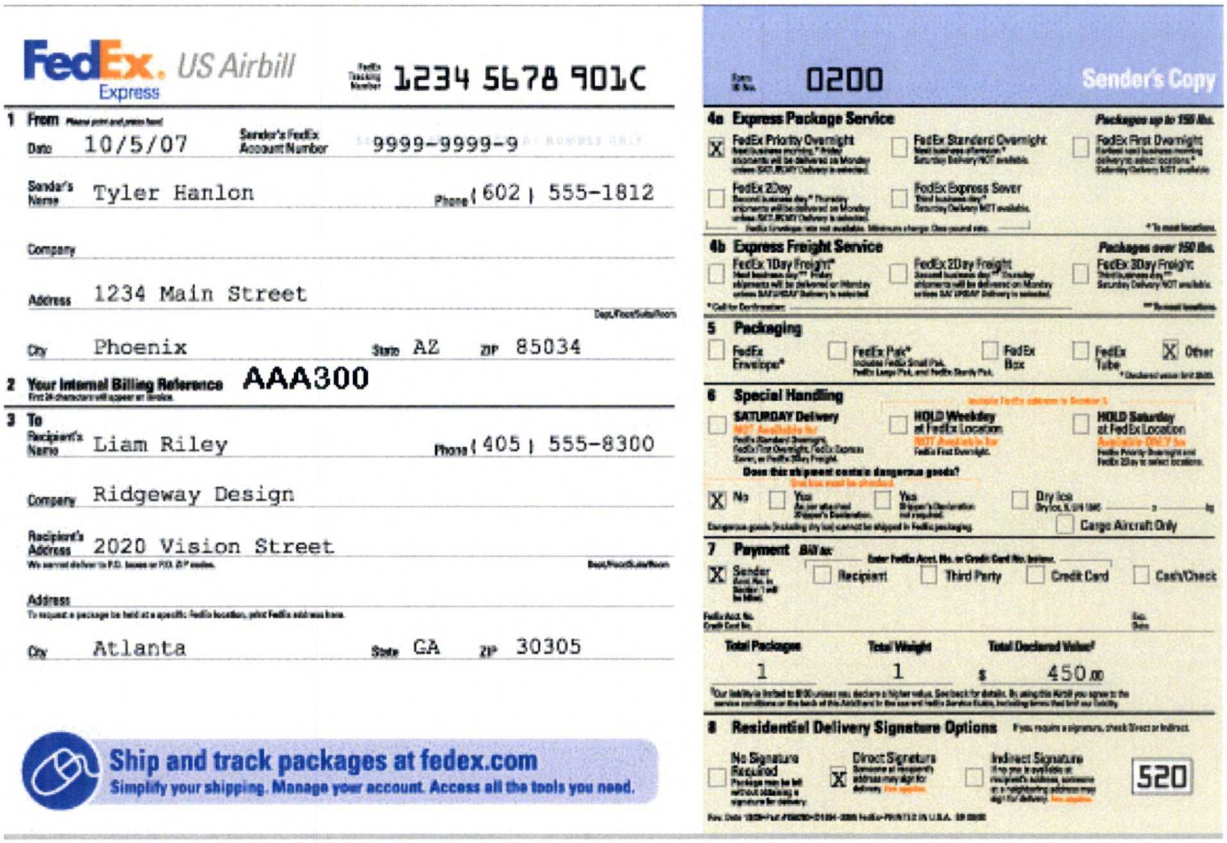
The following potential problems may occur during sample shipment:

- Leaking package. If a package leaks, the carrier may open the package and return the package. Special care should be taken during sample packaging to minimize potential leaks.
- Improper labeling and marking of package. If mistakes are made in labeling and marking the package, the carrier will most likely notice the mistakes and return the package to the shipper, thus delaying sample shipment. A good practice is to have labels, forms, and container markings double checked by a member of the field team.
- Bulk samples and air samples delivered to the analytical laboratory in the same container. If samples are combined in this way, they will be rejected. Always ship bulk samples in separate containers from air samples.
- Issues in packing asbestos samples. When asbestos samples are shipped, avoid using expanded polystyrene because of its static charge potential. Also avoid using particle-based packaging materials with asbestos samples because of possible contamination.
- Improper, misspelled, or missing information on the shipper's declaration. The carrier will most likely notice these errors as well and return the package to the shipper. A good practice is to have another field tram member double check this information.
- Missed drop off time or wrong location. Missing the drop off time or having the wrong location identified for drop off will delay delivery to the laboratory and may cause technical holding times to expire. Establish the time requirements in advance of completing the field effort and be sure and provide some contingency time for potential delays such as traffic or checking and redoing paperwork.
- Incorrectly packaging samples for analysis at multiple laboratories. For example, inorganic samples may be shipped to one laboratory for analysis, while organic samples may need to be shipped to another laboratory. All field staff should be aware which samples are to be shipped to which laboratory they package samples for multiple types of analysis.
- Holidays or weather-related delays. Be aware of holidays and weather forecasts that could cause delays in delivery. Delays caused by longer shipping times may cause technical holding times to expire, which in turn may compromise sample integrity or require recollection of samples for analysis.
- Not noting field variances in field log book. Field variances should be noted in the field log book and the project manager notified. Common field variances include:
  - Less sample volume collected than planned. Notify appropriate staff and the laboratory to ensure there is an adequate amount for analysis.

- Sample collected into incorrect jar because of broken or missing bottle-ware. Notify appropriate laboratory staff to ensure there is no confusion regarding the analysis of the sample.

FIGURE 1

EXAMPLE OF A FEDEX US AIRBILL FOR LOW LEVEL ENVIRONMENTAL SAMPLES



FedEx Express US Airbill — 1234 5678 901C — 0200 — Sender's Copy

1 From — Date: 10/5/07 — Sender's FedEx Account Number: 9999-9999-9
Sender's Name: Tyler Hanlon — Phone: (602) 555-1812
Company:
Address: 1234 Main Street
City: Phoenix — State: AZ — ZIP: 85034

2 Your Internal Billing Reference: AAA300

3 To
Recipient's Name: Liam Riley — Phone: (405) 555-8300
Company: Ridgeway Design
Recipient's Address: 2020 Vision Street
Address:
City: Atlanta — State: GA — ZIP: 30305

Ship and track packages at fedex.com
Simplify your shipping. Manage your account. Access all the tools you need.

4a Express Package Service — Packages up to 150 lbs.
[X] FedEx Priority Overnight — [ ] FedEx Standard Overnight — [ ] FedEx First Overnight
[ ] FedEx 2Day — [ ] FedEx Express Saver

4b Express Freight Service — Packages over 150 lbs.
[ ] FedEx 1Day Freight — [ ] FedEx 2Day Freight — [ ] FedEx 3Day Freight

5 Packaging
[ ] FedEx Envelope* — [ ] FedEx Pak* — [ ] FedEx Box — [ ] FedEx Tube — [X] Other

6 Special Handling
[ ] SATURDAY Delivery — [ ] HOLD Weekday at FedEx Location — [ ] HOLD Saturday at FedEx Location
Does this shipment contain dangerous goods?
[X] No — [ ] Yes — [ ] Yes — [ ] Dry Ice — [ ] Cargo Aircraft Only

7 Payment Bill to:
[X] Sender — [ ] Recipient — [ ] Third Party — [ ] Credit Card — [ ] Cash/Check

Total Packages: 1 — Total Weight: 1 — Total Declared Value*: $ 450.00

8 Residential Delivery Signature Options
[ ] No Signature Required — [X] Direct Signature — [ ] Indirect Signature

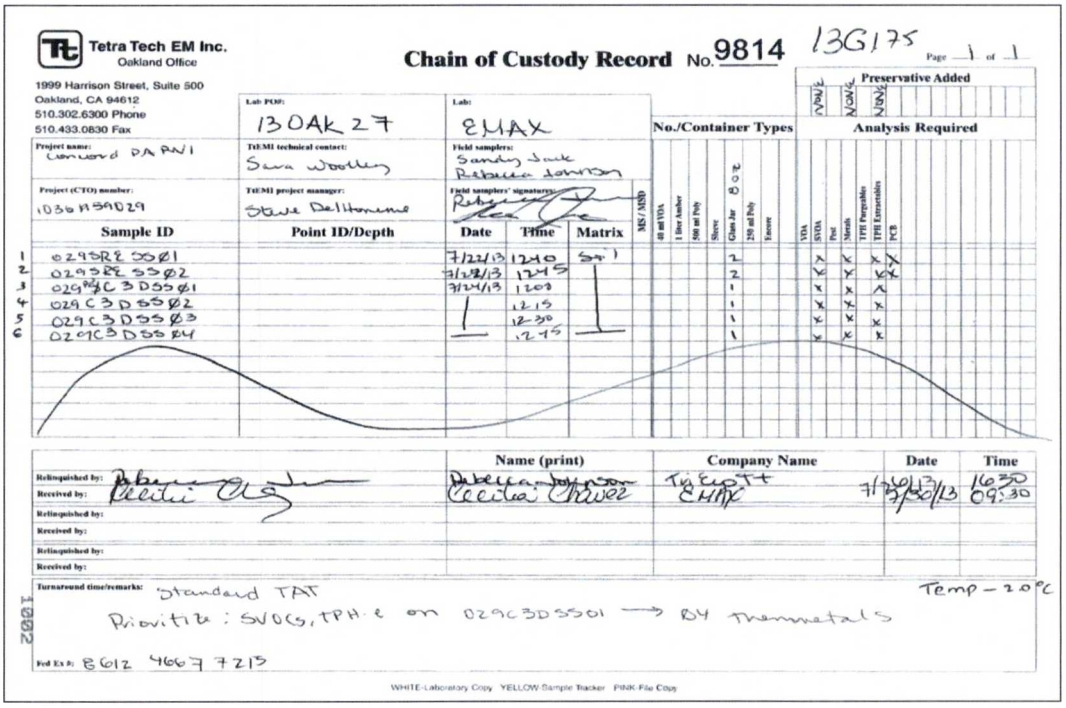
520

Filling Out the FedEx US Airbill

- The sender *must complete* the following fields on the pre-printed airbill:
  - Section 1: Date
  - Section 1: Sender's FedEx Account Number
  - Section 1: Sender's Name, Company, Address, and Phone Number
  - Section 2: Internal Billing Reference (Project Number)
  - Section 3: Recipient's Name, Company, Address, and Phone Number
  - Section 4: Express Package or Freight Services (Priority Overnight)
  - Section 5: Packaging (usually "Other," your own packaging)
  - Section 6: Special Handling (Saturday delivery if prearranged with receiving laboratory; "No" dangerous goods contained in shipment)
  - Section 7: Payment ("Bill to Sender")
  - Section 7: Total Number of Packages
  - Section 7: Total Weight (completed by FedEx employee)
  - Section 8: Delivery Signature Options ("No Signature Required")

FIGURE 2

EXAMPLE OF A CHAIN-OF-CUSTODY FORM (WHITE COPY)



Tetra Tech EM Inc.
Oakland Office

1999 Harrison Street, Suite 500
Oakland, CA 94612
510.302.6300 Phone
510.433.0830 Fax

Chain of Custody Record No. 9814 13G175 Page 1 of 1

Lab PM: 130Ak27
Lab: EMAX
Project name: Concord DA PA/I
TtEMI technical contact: Sara Woolley
Field samplers: Sandy Sauk, Rebecca Johnson
Project (CTO) number: 1036A59029
TtEMI project manager: Steve DeThomas
Field samplers' signature(s):

	Sample ID	Point ID/Depth	Date	Time	Matrix	MS/MSD	No./Container Types	Preservative Added	Analysis Required
1	029SB2 SS01		7/22/13	1240	Soil		2		VOA, SVOA, Pest, Metals, TPH Purgeables, TPH Extractables, PCB
2	029SB2 SS02		7/22/13	1245			2		
3	029SB3C3D SS01		7/24/13	1200			1		
4	029C3D SS02			1215			1		
5	029C3D SS03			1230			1		
6	029C3D SS04			1245			1		

	Name (print)	Company Name	Date	Time
Relinquished by:	Rebecca Johnson	TtEMI	7/26/13	1630
Received by:	Cecilia Chavez	EMAX	7/26/13	09:30
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Turnaround time/remarks: Standard TAT Temp – 20°C
Prioritize: SVOCs, TPH-g on 029C3DSS01 → BY Thermetals
Fed Ex #: 8612 4667 7215

WHITE-Laboratory Copy YELLOW-Sample Tracker PINK-File Copy

Completing a Sample Chain-of-Custody Form

After samples have been collected, they will be maintained under chain-of-custody procedures. These procedures are used to document the transfer of custody of the samples from the field to the designated analytical laboratory. The same chain-of-custody procedures will be used for the transfer of samples from one laboratory to another, if required.

The field sampling personnel will complete a Chain-of-Custody and Request for Analysis (CC/RA) Form (Figure 1, Chain of Custody Record) for each separate container of samples to be shipped or delivered to the laboratory for chemical or physical (geotechnical) analysis. Information contained on the triplicate, carbonless form will include:

1. Project identification (ID) (for example, contract and task order number);
2. Project Contract Task Order (CTO) number;
3. Laboratory Project Order (PO) number;
4. Tetra Tech Technical Contact;
5. Tetra Tech Project Manager
6. Laboratory name;
7. Field sampler names;
8. Field sampler signature;
9. Sample ID;
10. Point ID and Depth (Do **NOT** include this information on the laboratory copy of the chain-of-custody (top white copy);
11. Date and time of sampling;
12. Sample matrix type;
13. Sample preservation method; note "NONE" if no preservatives;
14. Number and types of sample containers and container capacity;
15. Sample hazards (if any);
16. Requested analysis;
17. Requested sample turnaround time or any special remarks;
18. Page __ of __;
19. Method of shipment;
20. Carrier/waybill number (if any);
21. Signature, name, and company of the person relinquishing the samples and the person receiving the samples when custody is transferred;
22. Date and time of sample custody transfer;

23. Condition of samples when they are received by the laboratory.

The sample collector will cross out any blank space on the CC/RA Form below the last sample number listed on the part of the form where samples are listed.

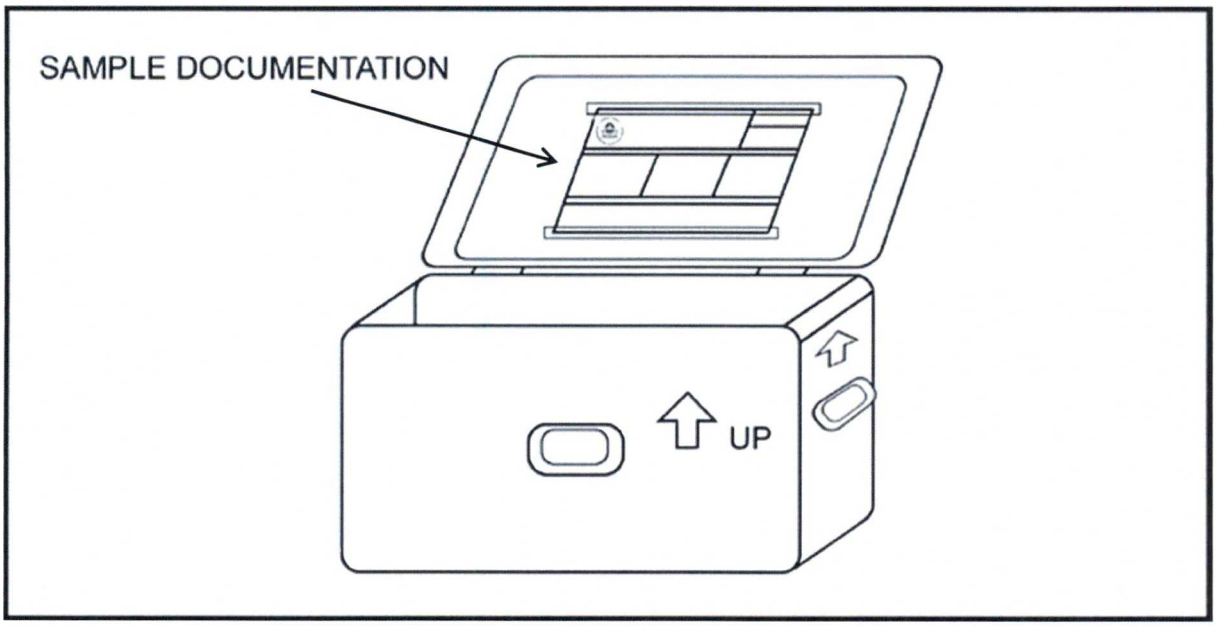
The sampling personnel whose signature appears on the CC/RA Form is responsible for the custody of a sample from time the sample is collected until the custody of the sample is transferred to a designated laboratory, a courier, or to another Tetra Tech employee for transporting a sample to the designated laboratory. A sample is considered to be in custody when the custodian: (1) has direct possession of it; (2) has plain view of it; or (3) has securely locked it in a restricted access area.

Custody is transferred when both parties to the transfer complete the portion of the CC/RA Form under "Relinquished by" and "Received by" or a sample is left at a FedEx facility pending shipment. Signatures, printed names, company names, and date and time of custody transfer are required. When custody is transferred, the Tetra Tech sampling personnel who relinquished the samples will retain the third sheet (pink copy) of the CC/RA Form. When the samples are shipped by a common carrier, a Bill of Lading supplied by the carrier will be used to document the sample custody, and its identification number will be entered on the CC/RA Form. Receipts of Bills of Lading will be retained as part of the permanent documentation in the Tetra Tech project file.

FIGURE 3

EXAMPLE OF A SAMPLE COOLER WITH ATTACHED DOCUMENTATION

Place the necessary paperwork (chain-of-custody form, cooler return instructions, and associated paperwork) in the shipping cooler or acceptable container. All paperwork must be placed in a plastic bag or pouch and then secured to the underside of the shipping container lid.



Source: U.S. Environmental Protection Agency. 2011.